C. Additional Clearances for Wires, Conductors, Cables, and Unguarded Rigid Live Parts of Equipment

Greater clearances than specified by Rule 232B shall be provided where required by Rule 232C1.

1. Voltages Exceeding 22 Kilovolts
   a. For voltages between 22 and 470 kilovolts, the clearance specified in Rule 232B1 (Table 232-1) or Rule 232B2 (Table 232-2) shall be increased at the rate of 0.4 in (10 mm) per kilovolt in excess of 22 kilovolts. For voltages exceeding 470 kilovolts, the clearance shall be determined by the method given in Rule 232D. All clearances for lines over 50 kilovolts shall be based on the maximum operating voltage.
   EXCEPTION: For voltages exceeding 98 kV alternating current to ground or 139 kV direct current to ground, clearances less than those required above are permitted for systems with known maximum switching surge factors (see Rule 232D).
   b. For voltages exceeding 50 kV, the additional clearance specified in Rule 232C1a shall be increased 3% for each 1000 ft (300 m) in excess of 3300 ft (1000 m) above mean sea level.
   c. For voltages exceeding 98 kV alternating current to ground, or 139 kV direct current to ground, either the clearances shall be increased or the electric field, or the effects thereof, shall be reduced by other means, as required, to limit the current due to electrostatic effects to 5.0 milliampere , rms, if the largest anticipated truck, vehicle, or equipment under the line were short circuited to ground. The size of the anticipated truck, vehicle, or equipment used to determine these clearances may be less than but need not be greater than that limited by Federal, State, or local regulations governing the area under the line. For this determination, the conductors shall be at a final unloaded sag at 120 °F (50 °C).

D. Alternate Clearances for Voltages Exceeding 98 Kilovolts Alternating Current to Ground or 139 Kilovolts Direct Current to Ground

The clearances specified in Rules 232B and 232C may be reduced for circuits with known switching surge factors, but

shall be not less than the alternate clearance, which is computed by adding the reference height from Rule 232D2 to the electrical component of clearance from Rule 232D3.

1. Sag Conditions of Line Conductors
   The vertical clearance shall be maintained under the conductor temperature and loading condition given in Rule 232A.
2. Reference Heights
   The reference height shall be selected from Table 232-3.
3. Electrical Component of Clearance
   a. The electrical component (D) shall be computed using the following equations. Selected values of D are listed in Table 232-4.

$$D = 3.28\left[\frac{V \cdot (PU) \cdot a}{500\,K}\right]^{1.667} bc \text{ (ft)}$$

$$D = 1.00\left[\frac{V \cdot (PU) \cdot a}{500\,K}\right]^{1.667} bc \text{ (m)}$$

where

V = maximum alternating current crest operating voltage to ground or maximum direct current operating voltage to ground in kilovolts;

PU = maximum switching surge factor expressed in per-unit peak voltage to ground and defined as a switching surge level for circuit breakers corresponding to 98% probability that the maximum switching surge generated per breaker operation does not exceed this surge level, or the maximum anticipated switching surge level generated by other means, whichever is greater;

a = 1.15, the allowance for three standard deviations;

b = 1.03, the allowance for nonstandard atmospheric conditions;

c = 1.2, the margin of safety;

K = 1.15, the configuration factor for conductor-to-plane gap.

   b. The value of D shall be increased 3% for each 1000 ft (300 m) in excess of 1500 ft (450 m) above mean sea level.

c. Either the clearances shall be increased or the electric field, or the effects thereof, shall be reduced by other means, as required, to limit the current due to electrostatic effects to 5.0 milliamperes, rms, if the largest anticipated truck, vehicle, or equipment under the line were short circuited to ground. The size of the anticipated truck, vehicle, or equipment used to determine these clearances may be less than but need not be greater than that limited by Federal, State, or local regulations governing the area under the line. For this determination, the conductors shall be at a final unloaded sag at 120 °F (50 °C).

4. Limit

The alternate clearance shall be not less than the clearance given in Tables 232-1 or 232-2 computed for 98 kilovolts alternating current to ground in accordance with Rule 232C.

Table 232-1 Vertical Clearance of Wires, Conductors, and Cables Above Ground, Roadway, Rail, or Water Surfaces

(Voltages are phase-to-ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly de-energizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.) **FT**

Nature of surface underneath wires, conductors, or cables	(11) Insulated communication conductors and cable; messengers; surge protection wires; grounded guys; neutral conductors meeting Rule 230E1; supply cables meeting Rule 230C1 (ft)	Non-insulated communication conductors; supply cables of 0 to 750 V meeting Rules 230C2 or 230C3 (ft)	Supply cables over 750 V meeting Rules 230C2 or 230C3; open supply conductors, 0 to 750 V (ft)	Open supply conductors, over 750 V to 22 kV (ft)	Trolley and electrified railroad contact conductors and associated span or messenger wires (1) 0 to 750 V to ground (ft)	Trolley and electrified railroad contact conductors and associated span or messenger wires (1) over 750 V to 22 kV to ground (ft)
Where wires, conductors, or cables cross over or overhang						
1. Track rails of railroads (except electrified railroads using overhead trolley conductors) (2) (16) (20)	23.5	24.0	24.5	26.5	22.0 (4)	22.0 (4)
2. Roads, streets, alleys; nonresidential driveways, parking lots, and other areas subject to truck traffic (21)	15.5 (13)	16.0 (13)	16.5	18.5	18.0 (5)	20.0 (5)
3. Residential driveways	15.5 (7) (13)	16.0 (7) (13)	16.5 (7)	18.5	18.0 (5)	20.0 (5)
4. Other land traversed by vehicles, such as cultivated, grazing, forest, orchard, etc	15.5	16.0	16.5	18.5	-	-
5. Spaces and ways subject to pedestrians or restricted traffic only (9)	14.0	12.0 (8)	12.5 (8)	14.5	16.0	18.0
6. Water areas not suitable for sailboating or where sailboating is prohibited (19)	14.0	14.5	15.0	17.0	-	-
7. Water areas suitable for sailboating including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with an unobstructed surface area of: (17) (18) (19)						
(a) Less than 20 acres	17.5	18.0	18.5	20.5	-	-
(b) 20 to 200 acres	25.5	26.0	26.5	28.5	-	-
(c) Over 200 to 2000 acres	31.5	32.0	32.5	34.5	-	-
(d) Over 2000 acres	37.5	38.0	38.5	40.5	-	-
8. Public or private land and water areas posted for rigging or launching sailboats	Clearance above ground shall be 5 ft greater than in 7 above, for the type of water areas served by the launching site					
Where wires, conductors, or cables run along and within the limits of highways or other road rights-of-way but do not overhang the roadway						
9. Roads, streets, or alleys	15.5 (13) (24)	16.0 (13)	16.5	18.5	18.0 (5)	20.0 (5)
10. Roads in rural districts where it is unlikely that vehicles will be crossing under the line	13.5 (10) (12)	14.0 (10)	14.5 (10)	16.5	18.0 (5)	20.0 (5)

(1) Where subways, tunnels, or bridges require it, less clearances above ground or rails than required by Table 232-1 may be used locally. The trolley and electrified railroad contact conductor should be graded very gradually from the regular construction down to the reduced elevation.

(2) For wire, conductors, or cables crossing over mine, logging, and similar railways which handle only cars lower than standard freight cars, the clearance may be reduced by an amount equal to the difference in height between the highest loaded car handled and 22 ft, but the clearances shall not be reduced below that required for street crossings.

(3) This footnote not used in this edition.

(4) In communities where 21 ft has been established, this clearance may be continued if carefully maintained. The elevation of the contact conductor should be the same in the crossing and next adjacent spans. (See Rule 225D2 for conditions which must be met where uniform height above rail is impractical.)

(5) In communities where 16 ft has been established for trolley and

electrified railroad contact conductors 0 to 750 V to ground, or 18 ft for trolley and electrified railroad contact conductors exceeding 750 V, or where local conditions make it impractical to obtain the clearance given in the table, these reduced clearances may be used if carefully maintained.

(6) This footnote not used in this edition.

(7) Where the height of attachment to a building or other installation does not permit service drops to meet these values, the clearances may be reduced to the following:

		(feet)
(a)	Insulated supply service drops limited to 300 V to ground	12.5
(b)	Insulated drip loops of supply service drops limited to 300 V to ground	10.5
(c)	Supply service drops limited to 150 V to ground and meeting Rules 230C1 or 230C3	12.0
(d)	Drip loops only of service drops limited to 150 V to ground and meeting Rules 230C1 or 230C3	10.0
(e)	Insulated communication service drops.	11.5

(8) Where the height of attachment to a building or other installation does not permit service drops to meet these values, the clearances may be reduced to the following:

		(feet)
(a)	Insulated supply service drops limited to 300 V to ground	10.5
(b)	Insulated drip loops of supply service drops limited to 300 V to ground	10.5
(c)	Supply service drops limited to 150 V to ground and meeting Rules 230C1 or 230C3	10.0
(d)	Drip loops only of supply service drops limited to 150 V to ground and meeting Rules 230C1 or 230C3.	10.0

(9) Spaces and ways subject to pedestrians or restricted traffic only are those areas where equestrians, vehicles, or other mobile units, exceeding 8 ft in height, are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered or not reasonably anticipated.

(10) Where a supply or communication line along a road is located relative to fences, ditches, embankments, etc, so that the ground under the line would not be expected to be travelled by pedestrians, this clearance may be reduced to the following values:

		(feet)
(a)	Insulated communication conductor and communication cables	9.5
(b)	Conductors of other communication circuits	9.5
(c)	Supply cables of any voltage meeting Rule 230C1 and supply cables limited to 150 V to ground meeting Rules 230C2 or 230C3	9.5
(d)	Insulated supply conductors limited to 300 V to ground	12.5
(e)	Guys	9.5

(11) No clearance from ground is required for anchor guys not crossing tracks, rails, streets, driveways, roads, or pathways.

(12) This clearance may be reduced to 13 ft for communication conductors and guys.

(13) Where this construction crosses over or runs along alleys, driveways, or parking lots, this clearance may be reduced to 15 ft.

(14) This footnote not used in this edition.

(15) This footnote not used in this edition.

(16) Adjacent to tunnels and overhead bridges which restrict the height of loaded rail cars to less than 22 ft, these clearances may be reduced by the difference between the highest loaded rail car handled and 22 ft, if mutually agreed to by the parties at interest.

(17) For controlled impoundments, the surface area and corresponding clearances shall be based upon the design high water level. For other waters, the surface area shall be that enclosed by its annual high water mark, and clearances shall be based on the normal flood level. The clearance over rivers, streams, and canals shall be based upon the largest surface area of any 1 mi long segment which includes the crossing. The clearance over a canal, river, or stream normally used to provide access for sailboats to a larger body of water shall be the same as that required for the larger body of water.

(18) Where an overwater obstruction restricts vessel height to less than the applicable reference height given in Table 232-3, the required clearance may be reduced by the difference between the reference height and the overwater obstruction height, except that the reduced clearance shall be not less than that required for the surface area on the line-crossing side of the obstruction.

(19) Where the US Army Corps of Engineers, or the State, or surrogate thereof has issued a crossing permit, clearances of that permit shall govern.

(20) See Rule 234I for the required horizontal and diagonal clearances to rail cars.

(21) For the purpose of this rule, trucks are defined as any vehicle exceeding 8 ft in height. Areas not subject to truck traffic are areas where truck traffic is not normally encountered or not reasonably anticipated.

(22) This footnote not used in this edition.

(23) This footnote not used in this edition.

(24) Communication cables and conductors may have a clearance of 15 ft where poles are back of curbs or other deterrents to vehicular traffic.

Table 232-1 Vertical Clearance of Wires, Conductors, and Cables Above Ground, Roadway, Rail, or Water Surfaces

(Voltages are phase-to-ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly de-energizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.) M

Nature of surface underneath wires, conductors, or cables	(11) Insulated communication conductors and cable; messengers; surge protection wires; grounded guys; neutral conductors meeting Rule 230E1; supply cables meeting Rule 230C1 (m)	Non-insulated communication conductors; supply cables of 0 to 750 V meeting Rules 230C2 or 230C3 (m)	Supply cables over 750 V meeting Rules 230C2 or 230C3; open supply conductors, 0 to 750 V (m)	Open supply conductors, over 750 V to 22 kV (m)	Trolley and electrified railroad contact conductors and associated span or messenger wires (1)	
					0 to 750 V to ground (m)	over 750 V to 22 kV to ground (m)
Where wires, conductors, or cables cross over or overhang						
1. Track rails of railroads (except electrified railroads using overhead trolley conductors) (2) (16) (20)	7.2	7.3	7.5	8.1	6.7 (4)	6.7 (4)
2. Roads, streets, alleys; nonresidential driveways, parking lots, and other areas subject to truck traffic (21)	4.7 (13)	4.9 (13)	5.0	5.6	55 (5)	6.1 (5)
3. Residential driveways	4.7 (7) (13)	4.9 (7) (13)	5.0 (7)	5.6	5.5 (5)	6.1 (5)
4. Other land traversed by vehicles, such as cultivated, grazing, forest, orchard, etc	4.7	4.9	5.0	5.6	-	-
5. Spaces and ways subject to pedestrians or restricted traffic only (9)	2.90	3.6 (8)	3.8 (8)	4.4	4.9	5.5
6. Water areas not suitable for sailboating or where sailboating is prohibited (19)	4.3	4.4	4.6	5.2	-	-
7. Water areas suitable for sailboating including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with an unobstructed surface area of: (17) (18) (19)						
(a) Less than 20 ha	5.3	5.5	5.6	6.2	-	-
(b) 20 to 200 ha	7.8	7.9	8.1	8.7	-	-
(c) Over 200 to 2000 ha	9.6	9.8	9.9	10.5	-	-
(d) Over 2000 ha	11.4	11.6	11.7	12.3	-	-
8. Public or private land and water areas posted for rigging or launching sailboats	Clearance above ground shall be 1.5 m greater than in 7 above, for the type of water areas served by the launching site					
Where wires, conductors, or cables run along and within the limits of highways or other road rights-of-way but do not overhang the roadway						
9. Roads, streets, or alleys	4.7 (13) (24)	4.9 (13)	5.0	5.6	5.5 (5)	6.1 (5)
10. Roads in rural districts where it is unlikely that vehicles will be crossing under the line	4.1 (10) (12)	4.3 (10)	4.4 (10)	5.0	5.5 (5)	6.1 (5)

(1) Where subways, tunnels, or bridges require it, less clearances above ground or rails than required by Table 232-1 may be used locally. The trolley and electrified railroad contact conductor should be graded very gradually from the regular construction down to the reduced elevation.

(2) For wire, conductors, or cables crossing over mine, logging, and similar railways which handle only cars lower than standard freight cars, the clearance may be reduced by an amount equal to the difference in height between the highest loaded car handled and 6.7 m, but the clearances shall not be reduced below that required for street crossings.

(3) This footnote not used in this edition.

(4) In communities where 6.4 m has been established, this clearance may be continued if carefully maintained. The elevation of the contact conductor should be the same in the crossing and next adjacent spans. (See Rule 225D2 for conditions which must be met where uniform height above rail is impractical.)

(5) In communities where 4.9 m has been established for trolley and

electrified railroad contact conductors 0 to 750 V to ground, or 5.5 m for trolley and electrified railroad contact conductors exceeding 750 V, or where local conditions make it impractical to obtain the clearance given in the table, these reduced clearances may be used if carefully maintained.

(6) This footnote not used in this edition.

(7) Where the height of attachment to a building or other installation does not permit service drops to meet these values, the clearances may be reduced to the following:

	(meters)
(a) Insulated supply service drops limited to 300 V to ground	3.8
(b) Insulated drip loops of supply service drops limited to 300 V to ground	3.2
(c) Supply service drops limited to 150 V to ground and meeting Rules 230C1 or 230C3	3.6
(d) Drip loops only of service drops limited to 150 V to ground and meeting Rules 230C1 or 230C3	3.0
(e) Insulated communication service drops.	3.5

(8) Where the height of attachment to a building or other installation does not permit service drops to meet these values, the clearances may be reduced to the following:

	(meters)
(a) Insulated supply service drops limited to 300 V to ground	3.2
(b) Insulated drip loops of supply service drops limited to 300 V to ground	3.2
(c) Supply service drops limited to 150 V to ground and meeting Rules 230C1 or 230C3	3.0
(d) Drip loops only of supply service drops limited to 150 V to ground and meeting Rules 230C1 or 230C3.	3.0

(9) Spaces and ways subject to pedestrians or restricted traffic only are those areas where equestrians, vehicles, or other mobile units, exceeding 2.45 m in height, are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered or not reasonably anticipated.

(10) Where a supply or communication line along a road is located relative to fences, ditches, embankments, etc, so that the ground under the line would not be expected to be travelled by pedestrians, this clearance may be reduced to the following values:

	(meters)
(a) Insulated communication conductor and communication cables	2.90
(b) Conductors of other communication circuits	2.90
(c) Supply cables of any voltage meeting Rule 230C1 and supply cables limited to 150 V to ground meeting Rules 230C2 or 230C3	2.90
(d) Insulated supply conductors limited to 300 V to ground	3.8
(e) Guys	2.90

(11) No clearance from ground is required for anchor guys not crossing tracks, rails, streets, driveways, roads, or pathways.

(12) This clearance may be reduced to 4.0 m for communication conductors and guys.

(13) Where this construction crosses over or runs along alleys, driveways, or parking lots, this clearance may be reduced to 4.6 m.

(14) This footnote not used in this edition.

(15) This footnote not used in this edition.

(16) Adjacent to tunnels and overhead bridges which restrict the height of loaded rail cars to less than 6.7 m, these clearances may be reduced by the difference between the highest loaded rail car handled and 6.7 m, if mutually agreed to by the parties at interest.

(17) For controlled impoundments, the surface area and corresponding clearances shall be based upon the design high water level. For other waters, the surface area shall be that enclosed by its annual high water mark, and clearances shall be based on the normal flood level. The clearance over rivers, streams, and canals shall be based upon the largest surface area of any 1.6 km long segment which includes the crossing. The clearance over a canal, river, or stream normally used to provide access for sailboats to a larger body of water shall be the same as that required for the larger body of water.

(18) Where an overwater obstruction restricts vessel height to less than the applicable reference height given in Table 232-3, the required clearance may be reduced by the difference between the reference height and the overwater obstruction height, except that the reduced clearance shall be not less than that required for the surface area on the line-crossing side of the obstruction.

(19) Where the US Army Corps of Engineers, or the State, or surrogate thereof has issued a crossing permit, clearances of that permit shall govern.

(20) See Rule 234I for the required horizontal and diagonal clearances to rail cars.

(21) For the purpose of this rule, trucks are defined as any vehicle exceeding 2.45 m in height. Areas not subject to truck traffic are areas where truck traffic is not normally encountered or not reasonably anticipated.

(22) This footnote not used in this edition.

(23) This footnote not used in this edition.

(24) Communication cables and conductors may have a clearance of 4.6 m where poles are back of curbs or other deterrents to vehicular traffic.

Table 232-2 Vertical Clearance of Equipment Cases and Unguarded Rigid Live Parts Above Ground or Roadway Surfaces

(Voltages are phase-to-ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly de-energizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.) FT

Nature of surface below:	Effectively grounded equipment cases ⑥ (ft)	Unguarded rigid live parts of 0 to 750 V and ungrounded cases that contain equipment connected to circuits of not more than 750 V (ft)	Unguarded rigid live parts of over 750 V to 22 kV and ungrounded cases that contain equipment connected to circuits of over 750 V to 22 kV (ft)
1. Where rigid parts overhang:			
a. Roads, streets, alleys; nonresidential driveways; parking lots and other areas subject to truck traffic ④	15.0	16.0	18.0
b. Residential driveways	15.0	16.0 ①	18.0
c. Other land traversed by vehicles such as cultivated land, grazing land, forest, orchard, etc.	15.0	16.0	18.0
d. Spaces and ways subject to pedestrians or restricted traffic only ⑤	11.0 ⑦	12.0 ⑪	14.0
2. Where rigid parts are along and within the limits of highways or other road rights-of-way but do not overhang the roadway:			
a. Roads, streets, and alleys	15.0	16.0	18.0
b. Roads in rural districts where it is unlikely that vehicles will be crossing under the line	13.0 ⑦	14.0 ②	16.0

① This clearance may be reduced to the following values:

	(feet)
a. Insulated live parts limited to 300 V to ground	12
b. Insulated live parts limited to 150 V to ground and drip loops of service drop conductors limited to 150 V to ground and meeting Rules 230C2 or 230C3.	10

② Where a supply line along a road is limited to 300 V to ground and is located relative to fences, ditches, embankments, etc, so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to 12 ft.

③ This footnote not used in this edition.

④ For the purpose of this rule, trucks are defined as any vehicle exceeding 8 ft in height. Areas not subject to truck traffic are areas where truck traffic is not normally encountered or not reasonably anticipated.

⑤ Spaces and ways subject to pedestrians or restricted traffic only are those areas where equestrians, vehicles, or other mobile units, exceeding 8 ft in height, are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered or not reasonably anticipated.

⑥ The bottom of the housing of traffic control signals suspended over the traveled portion of the roadway shall be not less than 15 ft nor more than 19 ft above the grade at the center of the roadway.

⑦ Effectively grounded equipment cases such as fire alarm boxes, traffic control boxes, or meters may be mounted over a walkway at a lower level for accessibility provided such equipment does not unduly obstruct the walkway.

Table 232-2 Vertical Clearance of Equipment Cases and Unguarded Rigid Live Parts Above Ground or Roadway Surfaces

(Voltages are phase-to-ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly de-energizing the faulted section, both initially and following subsequent breaker operations. See the definition section for voltages of other systems.) M

Nature of surface below:	Effectively grounded equipment cases ⑥ (m)	Unguarded rigid live parts of 0 to 750 V and ungrounded cases that contain equipment connected to circuits of not more than 750 V (m)	Unguarded rigid live parts of over 750 V to 22 kV and ungrounded cases that contain equipment connected to circuits of over 750 V to 22 kV (m)
1. Where rigid parts overhang:			
a. Roads, streets, alleys; nonresidential driveways; parking lots and other areas subject to truck traffic ④	4.6	4.9	5.5
b. Residential driveways	4.6	4.9 ①	15.5
c. Other land traversed by vehicles such as cultivated land, grazing land, forest, orchard, etc.	4.6	4.9	5.5
d. Spaces and ways subject to pedestrians or restricted traffic only ⑤	3.4⑦	3.6 ⑬	4.3
2. Where rigid parts are along and within the limits of highways or other road rights-of-way but do not overhang the roadway:			
a. Roads, streets, and alleys	4.6	4.9	5.5
b. Roads in rural districts where it is unlikely that vehicles will be crossing under the line	4.0 ⑦	4.3 ②	4.9

① This clearance may be reduced to the following values:

	(meters)
a. Insulated live parts limited to 300 V to ground	3.6
b. Insulated live parts limited to 150 V to ground and drip loops of service drop conductors limited to 150 V to ground and meeting Rules 230C2 or 230C3.	3.0

② Where a supply line along a road is limited to 300 V to ground and is located relative to fences, ditches, embankments, etc, so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to 3.6 m.

③ This footnote not used in this edition.

④ For the purpose of this rule, trucks are defined as any vehicle exceeding 2.45 m in height. Areas not subject to truck traffic are areas where truck traffic is not normally encountered or not reasonably anticipated.

⑤ Spaces and ways subject to pedestrians or restricted traffic only are those areas where equestrians, vehicles, or other mobile units, exceeding 2.45 m in height, are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered or not reasonably anticipated.

⑥ The bottom of the housing of traffic control signals suspended over the traveled portion of the roadway shall be not less than 4.6 m nor more than 5.8 m above the grade at the center of the roadway.

⑦ Effectively grounded equipment cases such as fire alarm boxes, traffic control boxes, or meters may be mounted over a walkway at a lower level for accessibility provided such equipment does not unduly obstruct the walkway.

Table 232-3
Reference Heights

Nature of surface underneath lines	(ft)	(m)
a. Track rails of railroads (except electrified railroads using overhead trolley conductors) ①	22	6.7
b. Streets, alleys, roads, driveways, and parking lots	14	4.3
c. Spaces and ways subject to pedestrians or restricted traffic only ②	10	3.0
d. Other land, such as cultivated, grazing, forest, or orchard, which is traversed by vehicles	14	4.3
e. Water areas not suitable for sailboating including or where sailboating is prohibited	12.5	4.9
f. Water areas suitable for sailboating including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with unobstructed surface area ③ ④		
(1) less than 20 acres (8 ha)	16	4.9
(2) 20 to 200 acres (8 to 80 ha)	24	7.3
(3) 200 to 2000 acres (80 to 800 ha)	30	9.0
(4) over 2000 acres (800 ha)	36	11.0
g. In public or private land and water areas posted for rigging or launching sailboats, the reference height shall be 5 ft (1.5 m) greater than in f above, for the type of water areas serviced by the launching site		

① See Rule 234I for the required horizontal and diagonal clearances to rail cars.

② Spaces and ways subject to pedestrians or restricted traffic only are those areas where equestrians, vehicles, or other mobile units, exceeding 8 ft (2.45 m) in height, are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered or not reasonably anticipated.

③ For controlled impoundments, the surface area and corresponding clearances shall be based upon the design high water level. For other waters, the surface area shall be that enclosed by its annual high water mark, and clearances shall be based on the normal flood level. The clearances over rivers, streams, and canals shall be based upon the largest surface area of any 1 mile long (1600 m) segment which includes the crossing. The clearance over a canal or similar waterway providing access for sailboats to a larger body of water shall be the same as that required for the larger body of water.

④ Where an overwater obstruction restricts vessel height to less than the applicable reference height, the required clearance may be reduced by the difference between the reference height and the overwater obstruction height, except that the reduced clearance shall be not less than that required for the surface area on the line-crossing side of the obstruction.

Table 232-4 Electrical Component of Clearance in Rule 232D3a

(Add 3% for each 1000 ft (300 m) in excess of 1500 ft (450 m) above mean sea level. Increase clearance to limit electrostatic effects in accordance with Rule 232D3c.)

Maximum operating voltage phase-to-phase (kV)	Switching surge factor (per unit)	Switching surge (kV)	Electrical component of clearance (ft)	(m)
242	3.97 or less	785 or less	① 8.6	2.60
362	2.65 or less	785 or less	① 8.6	2.60
550	1.75 or less	785 or less	① 8.6	2.60
	1.90	853	9.9	3.0
	2.00	898	10.8	3.3
	2.20	988	12.7	3.9
	2.40	1079	14.6	4.4
	2.60	1168	16.7	5.1
800	1.60	1045	13.9	4.2
	1.80	1176	16.9	5.2
	2.00	1306	20.1	6.1
	2.10 or more	1372 or more	②21.8	6.6

① Limited by Rule 232D4.

② Limited by Rules 232A and 232B.

233. Clearances Between Wires, Conductors, and Cables Carried on Different Supporting Structures

A. General

Crossings should be made on a common supporting structure, where practical. In other cases, the clearance between any two crossing or adjacent wires, conductors, or cables carried on different supporting structures shall be not less at any location in the spans than that required by Rules 233B and 233C. The clearance shall be not less than that required by application of a clearance envelope developed under Rule 233A2 to the positions on or within conductor movement envelopes developed under Rule 233A1 at which the two wires, conductors, or cables would be closest together. For purposes of this determination, the relevant positions of the wires, conductors, or cables on or within their respective conductor movement envelopes are those which can occur when (1) both are simultaneously subjected to the same ambient air temperature and wind loading conditions and (2) each is subjected individually to the full range of its icing conditions and applicable design electrical loading.

Figure 233-1 is a graphical illustration of the application of Rule 233A. Alternate methods that assure compliance with these rules may be used.

1. **Conductor Movement Envelope**
   - a. **Development**

     The conductor movement envelope shall be developed from the locus of the most displaced conductor positions defined below and shown in Fig 233-2.

     (1) **60 °F (15 °C), no wind displacement, at both initial unloaded and final unloaded sag (conductor positions A and C).**

     (2) **With the wire, conductor, or cable displaced from rest by a six pounds per square foot (290 Pa) wind at both initial and final sag at 60 °F (15 °C). This may be reduced to 4 pounds per square foot (190 Pa) wind in areas sheltered by buildings, terrain, or other obstacles. The displacement of the wire, conductor, or cable shall include deflection of suspension insulators**

Table 235-5 Vertical Clearance Between Conductors at Supports

IN

(When using column and row headings, voltages are phase to ground for effectively grounded circuits and those other circuits where all ground faults are cleared by promptly de-energizing the faulted section, both initially and following subsequent breaker operations. See the definitions section for voltages of other systems.)

Conductors usually at upper levels / Conductors usually at lower levels	Supply cables meeting Rule 230C1, 2, or 3; neutral conductors meeting Rule 230E1 (in)	Open supply conductors		
		0 to 8.7 kV (in)	Over 8.7 to 50 kV	
			Same utility ⑧ (in)	Different utilities ⑨ (in)
1. Communication conductors				
a. Ordinary	40 ①⑥	40	40	40 plus 0.4 per kV ⑦ over 8.7 kV
b. Used in operation of supply lines	16	16 ②	40	40 plus 0.4 per kV ⑦ over 8.7 kV
2. Supply conductors				
a. 0 to 750 V; supply cables meeting Rule 230C1, 2, or 3; neutral conductors meeting Rule 230E1	16	16 ③	16 plus 0.4 per kV ⑦ over 8.7 kV	40 plus 0.4 per kV ⑦ over 8.7 kV
b. Over 750 V to 8.7 kV		16 ③	16 plus 0.4 per kV ⑧⑦ over 8.7 kV	40 plus 0.4 per kV ⑦ over 8.7 kV
c. Over 8.7 kV to 22 kV				
(1) If worked on alive with live-line tools and adjacent circuits are neither de-energized nor covered with shields or protectors			16 plus 0.4 per kV ⑦ over 8.7 kV	40 plus 0.4 per kV ⑦ over 8.7 kV

Appendix A

(This Appendix is not part of ANSI C2-1990, National Electrical Safety Code, 1990 edition, but is included for information only.)

Uniform System of Clearances Adopted in the 1990 Edition

Rules 232, 233, and 234

Introduction

The original format or system for stating NESC requirements was developed before 1920 and recognized the practical constraints of that time: Clearances were specified for a set of Basic Conditions. Some *Basic Clearances* included conductor movement; adders were used for non-basic conditions. Although easy to use, it was unduly conservative in many cases, and did not adequately recognize new materials and construction in others. Various additional clearance requirements were added over the years.

An intensive study by the NESC Clearances Subcommittee identified:

- modern utility practices and capabilities that remove the previous clearance measurement constraints,
- apparent inconsistencies in certain clearance treatments, and
- the need to develop a uniform clearance system independent of materials used for conductors and cables, stringing tensions, operating temperatures, and similar constraints.

The new uniform clearance system contained in the 1990 edition reflects the dimensions of expected activities in each area (reference component), as well as the relative potential problem caused by each type of facility (mechanical and electrical component).

Conductor clearance in the 1990 edition is stated in terms of the "closest approach," ie, the clear distance that must be maintained under specified conditions.

- Vertical clearances are required during maximum sag conditions; they provide for expected activity beneath a line.

- Horizontal clearances are required when the conductor is at rest; they provide for expected activity alongside a line. In addition, displacement of conductors by wind is considered under certain conditions.

Under the new system, users consider the actual characteristics of the materials and construction, rather than the reference characteristics built into the early code requirements.

While some clearance values in the new system may appear to be larger and some smaller, the net effective clearances for conductors and cables are, for most of the clearance values, essentially unchanged. Some few values required minor adjustments of the effective clearances to make them uniform with the other values, thus illustrating one of the needs for these changes.

The 1990 edition provides the following user benefits:

- simple code language in performance-standard format (as opposed to the prior design-manual style)
- readily understandable intent
- uniform clearance values
- integration of prior rules for long span construction and/or high conductor temperature operation
- reduced number of footnotes required to cover exceptions.

Clearance Rules and Tables Prior to 1990

In prior editions, clearances shown in the tables were *basic clearances*, applied under specified conditions of conductor temperature and sag, span length, and voltage range. For example, vertical clearances in Table 232-1 of the 1987 edition applied at a conductor temperature of 60 °F, no wind, final unloaded sag. Span lengths were limited by loading district. Voltages up to 50 kV were covered in the table. Conditions outside these basic conditions required additional clearances.

Actual clearances vary from the values required at 60 °F as conductor sag changes due to conductor movement under loading. Table 232-1 allowed 24 inches for ice loading, higher conductor temperatures (to 120 °F), and structure flexure. The actual allowance was 18 inches for ice loading or higher conductor temperature plus 6 inches for miscellaneous causes. Thus the true clearance requirement was 24 inches less than the value shown in the table (ie, equivalent to the clearance required for rigid parts).

Table 232-2, vertical clearance of *rigid* live parts, was consistent with the 24 inch allowance in Table 232-1. A rigid live part energized at 750 V to 22 kV over a road (item 1a, middle column) required 18 feet clearance. A conductor energized at the same voltage over a road required 20 feet clearance (Table 232-1, item 2). The additional 24 inches was the allowance for conductor movement, and the true clearance that may be experienced is 18 feet–the same as specified for rigid live parts.

Additional clearances above the basic values shown in Table 232-1 were required when the limiting conditions were exceeded. Rule 232B2c covered long span construction and Rule 232B2d covered high-temperature operation. Both rules recognized and allowed for additional conductor movement. Finally, Rule 232B1 required additional clearance for voltages exceeding 50 kV. Note that this was an electrical requirement apart from conductor movement.

Application of basic and additional clearances is illustrated in the drawings that follow.

Figure 1 shows the basic clearance applied at a 60 °F conductor temperature, at the limiting span length. When conductor movement is considered, the actual clearance at maximum sag is less than the basic clearance.

Figure 2 shows application of an additional clearance for conductor temperature over 120 °F, at the limiting span. Note that the additional clearance is added to the basic clearance to determine the required clearance. Again, the actual clearance at maximum sag is essentially the same as in Figure 1.

Figure 3 shows application of a long-span additional clearance, for a conductor operating at or within the 120 °F limit. As before, the additional clearance is added to the basic clearance, and the actual conductor clearance at maximum sag is essentially the same as in Figure 1.

To repeat, *both the basic clearances shown in the tables and the additional clearances required by the rules apply only when the conductor temperature is 60 °F. Actual clearances are expected and intended to be less due to conductor movement.* Only the voltage adder (for voltages above those shown in the tables) is a true clearance requirement.

Clearance Values Prior to 1990

Clearance values were based on experience. They were developed over time, at different times, for different reasons.

While those clearance values worked well, partly because several of them proved to be overly conservative, they did not follow a uniform system. For example, Table 234-1 showed vertical clearances from buildings. In line 1b(1) of the 1987 edition, vertical clearance of open supply conductors over roofs not accessible to pedestrians was the same for all voltages from 0 to 22 kV. However, in line 1b(3), the vertical clearance of open supply conductors over roofs accessible to vehicles but not subject to truck traffic varied with voltage: 12 feet for conductors energized at 0 to 300 V, 15 feet for 300 to 750 V, and 20 feet for 750 V to 22 kV.

Summary—Prior Editions

The clearance section was complex, with requirements stated in design manual format. Clearance was a mixture of basic clearance, clearance to cover conductor movement, and voltage clearance. Required clearance applied only at a 60 °F conductor temperature; actual clearance was not shown. Finally, clearance values were empirical; they were not systematized.

Clearances Subcommittee Activities

Subcommittee 4 discussed problems with the clearance section of the code during the 1987 revision cycle. Because there was insufficient time to develop a comprehensive proposal, Subcommittee 4 recommended formation of a special working group. The NESC Committee approved this recommendation and established Working Group 4.2 to:

- Review overhead line clearances, primarily Rules 232 and 234 and Section 28, and
- Investigate feasibility of a uniform method of determining clearances under all conditions of conductor movement.

The working group concluded that:

- A uniform system for determining clearances could be developed utilizing a building block approach.

- Vertical clearance values could be stated for maximum sag conditions to cover conductor movement.
- Horizontal clearances could be stated under at-rest conditions, with special requirements to cover displacement of energized conductors during wind conditions.
- The revisions proposed in the working group report were explicit, readily understood, and performance oriented.

Subcommittee 4 reviewed and approved the Working Group 4.2 report with minor modifications. Further enhancements were made in response to public comment.

The 1990 Changes

Rules 232, 233, and 234 were revised based on a coordinated, uniform system of clearances developed under a building block approach. Three components were considered to determine the total clearance required:

- *A reference component* to cover activity in the area to be cleared by the overhead supply and/or communication lines. For example, truck height for over-the-road transport is limited to 14 feet by state regulation. Thus the reference component for roads in Table 232-3 is 14 feet. Reference components included in the required clearances are shown in Table A-2.
- *A mechanical component* appropriate for the supply or communication line item. The mechanical component for open supply conductors is 2 feet (Table A-1).
- *An electrical component* appropriate for the voltage involved. The electrical component for open supply conductors, over 750 V to 22 kV, is 2.5 feet (Table A-1).

The required clearance is the sum of the three components: thus, 18.5 feet is required for open supply conductors, over 750 V to 22 kV, over roads (Table 232-1). For purposes of illustration, the mechanical and electrical components are combined in Table A-1, and items with the same total mechanical and electrical components are grouped into similar clearance categories. Six groups are thus created.

Application rules were revised to coordinate with clearances developed under the component or building block approach.

Vertical clearances now apply at the maximum conductor sag condition, such as outlined in Rule 232A, rather than at a 60 °F conductor temperature condition as used in the 1987 edition. This is illustrated in Figure 4: 18.5 feet is required for open supply conductors, over 750 V to 22 kv, over roads, for any sag condition or span length.

Not only is the intended vertical clearance shown, *rule simplification* is also achieved. Rules for long span construction and/or high temperature operation were removed because they are no longer necessary.

Horizontal clearances to buildings and other installations now apply with the conductor at rest (no wind displacement) as outlined in Rule 234A, rather than at a wind displacement condition. The horizontal clearance for open supply conductors from buildings (over 750 V to 22 kV) at rest is now 7.5 feet (Table 234-1). This clearance is essentially the same as the 8.0 feet required by early code editions.

Wind displacement need be considered only for energized open supply conductors and 230C2-230C3 cables energized at more than 750 V; see Rule 234C1. In the above example, a minimum clearance of 4.5 feet is required under wind displacement conditions. While less than the 5 or 6 feet required under prior codes, people will not be working on outside building walls during high wind conditions.

Because application rules have been revised, *it must be understood that clearance values cannot be directly compared between the 1987 and 1990 editions*. Vertical clearance values *appear* smaller because sag changes formerly included in clearance values are now addressed in the application rules. Horizontal clearance values *appear* larger because wind displacement is now applicable to energized conductors and certain supply cables only; clearances for all wires, conductors, and cables are shown in the tables under at-rest conditions.

The following changes were also made to consolidate requirements and simplify application:

- Voltages in the tables are limited to 0 to 750 V and over 750 V to 22 kV, normal secondary and primary distribution ranges respectively. Voltages in the 22 to 50 kV range are covered by a 0.4 inch per kV adder; see Rules 232C1a, 232C2a, and 234G1. Exceptions at 22 to 50 kV are noted where they apply.

- Rules for voltages above 22 kV and the alternate clearances for voltages above 98 kV are consolidated.
- Clearances for equipment cases are relocated from Rules 286E and 286F to Rules 232B3 and 234J.

Summary

These changes constitute a comprehensive revision of Section 23 which incorporate related provisions of Section 28 and provide significant user benefits, as detailed in the introduction at the beginning of this discussion. While some clearance values may appear to be larger and some smaller, the net effective clearances for energized conductors and cables are essentially unchanged.

Table A-1

Group	M&E (ft)	Category	R/NR	GI/O	M	E
I	1.0	Support Arms	1.0/—	0.0/—	1.0	0.0
		Effectively Grounded Equipment Cases	1.0/—	0.0/—	1.0	0.0
II	1.5	Insulated Communication Conductors and Cables	—/1.5	0.0/—	1.5	0.0
		Messengers	—/1.5	0.0/—	1.5	0.0
		Surge Protection Wires	—/1.5	0.0/—	1.5	0.0
		Grounded Guys	—/1.5	0.0/—	1.5	0.0
		230E1	—/1.5	0.0/—	1.5	0.0
		230C1	—/1.5	0.0/—	1.5	0.0
III	2.0	URLP, 0-750 V	1.0/—	—/0.5	1.5	0.5
		Non-Insulated Communication Conductors	—/1.5	—/0.5	2.0	0.0
		230C2, 0-750 V	—/1.5	0.0/—	1.5	0.5
		230C3, 0-750 V	—/1.5	0.0/—	1.5	0.5
		Ungrounded Cases of Equipment at 0-750 V	1.0/—	—/0.5	1.5	0.5
IV	2.5	230C2, Greater Than 750 V	—/1.5	0.0/—	1.5	1.0*
		230C3, Greater Than 750 V	—/1.5	0.0/—	1.5	1.0*
		Open Supply Conductors, 0-750 V	—/1.5	—/0.5	2.0	0.5
V	4.0	URLP, Greater Than 750 V — 22 kV	1.0/—	—/0.5	1.5	2.5
		Ungrounded Cases of Equipment at Greater Than 750 V — 22 kV	1.0/—	—/0.5	1.5	2.5
VI	4.5	Open Supply Conductors, Greater Than 750 V — 22 kV	—/1.5	—/0.5	2.0	2.5

LEGEND:

URLP — Unguarded Rigid Live Parts
R — Rigid = 1.0 ft
NR — Non-Rigid = 1.5 ft
GI — Grounded or Insulated = 0.0 ft
O — Bare, Ungrounded or Open Conductor or Part = 0.5 ft
M — Mechanical Component = R/NR plus GI/O
E — Electrical Component
- Grounded & Communications Conductor = 0.0 ft
- Supply Line 0-750 V = 0.5 ft
- Supply Line Greater Than 750 V — 22 kV = 2.5 ft

M&E — Sum of M and E values

NOTES: (1) Ungrounded guys have clearances based on the highest voltage to which they are exposed.
(2) An asterisk (*) beside a value indicates an exception to the legend.

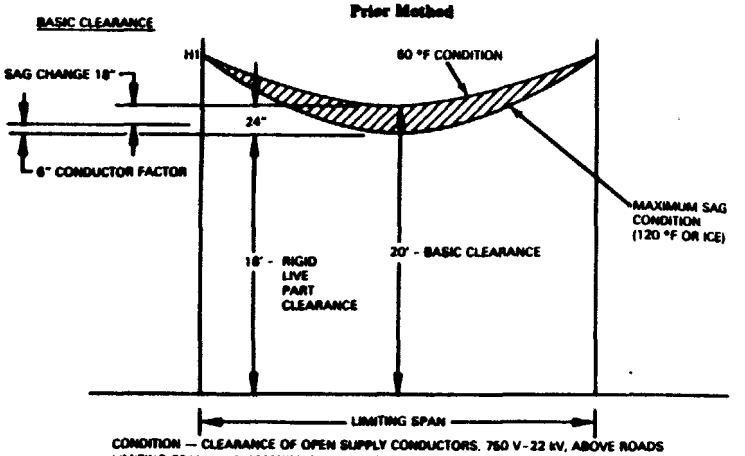
Table A-2a
Reference Components of Rule 232

	Table 232-1		Table 232-2	
	Item	Ref (ft)	Item	Ref (ft)
Track rails	1	22.0	—	—
Roads, streets, alleys, etc.	2	14.0	1a	14.0
Residential driveways, etc.	3	14.0	1b	14.0
Other land traversed by vehicles	4	14.0	1c	14.0
Spaces and ways — pedestrians	5	8.0/10.0	1d	10.0
Water areas — no sailboating	6	12.5	—	—
Water areas — sailboating	7		—	
(a) Less than 20 acres		16.0		—
(b) Over 20 to 200 acres		24.0		—
(c) Over 200 to 2000 acres		30.0		—
(d) Over 2000 acres		36.0		—
Areas posted for rigging or launching sailboats	8	See 7	—	
Within or along:				
Roads, streets, or alleys	9	14.0	2a	14.0
Rural districts, vehicles unlikely	10	12.0	2b	12.0

Table A-2b
Reference Components of Rule 234

Table	Item	Ref (ft)
234-1	1. Buildings	
	a. Horizontal	
	(1) Walls, projections and guarded windows	3.0
	(2) Unguarded windows	3.0
	(3) Balconies and areas accessible to pedestrians	3.0
	b. Vertical	
	(1) Roofs/projections not accessible to pedestrians	8.0
	(2) Balconies and roofs accessible to pedestrians	9.0
	(3) Roofs — vehicles not over 8 feet	9.0
	(4) Roofs — vehicles over 8 feet	14.0
	2. Signs, chimneys, billboards, antennas, tanks, etc.	
	a. Horizontal	3.0
	b. Vertical over or under	3.5
234-2	1. Over bridges	
	a. Attached	1.0
	b. Not attached	8.0
	2. Beside, under or within bridge structure	
	a. Accessible	
	(1) Attached	1.0
	(2) Not attached	3.0
	b. Inaccessible	
	(1) Attached	1.0
	(2) Not attached	2.0
234-3	A. From water level, edge of pool, etc.	20.5
	B. From diving platform or tower	12.5

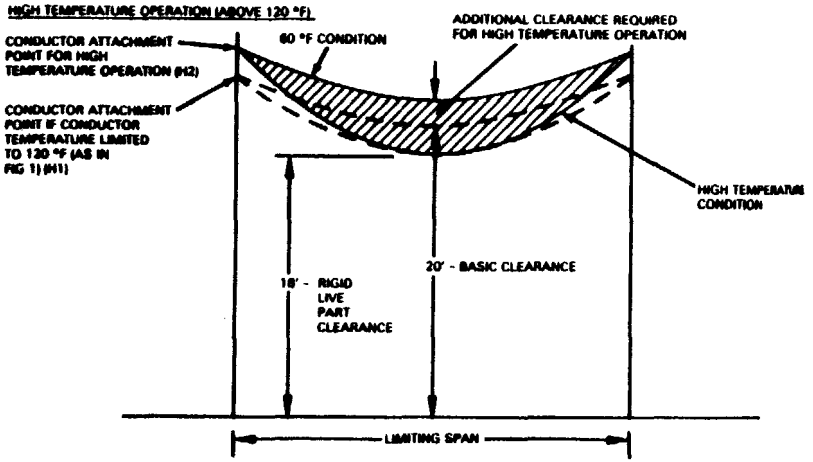
Prior Method



CONDITION — CLEARANCE OF OPEN SUPPLY CONDUCTORS, 750 V-22 kV, ABOVE ROADS
LIMITING SPAN — 175' MAXIMUM IN HEAVY LOADING DISTRICT
//////// — CONDUCTOR MOVEMENT
BASIC CLEARANCE (20') = ACTUAL + ACTUAL CLEARANCE (18') + CONDUCTOR MOVEMENT (2')

Fig 1
Basic Clearance

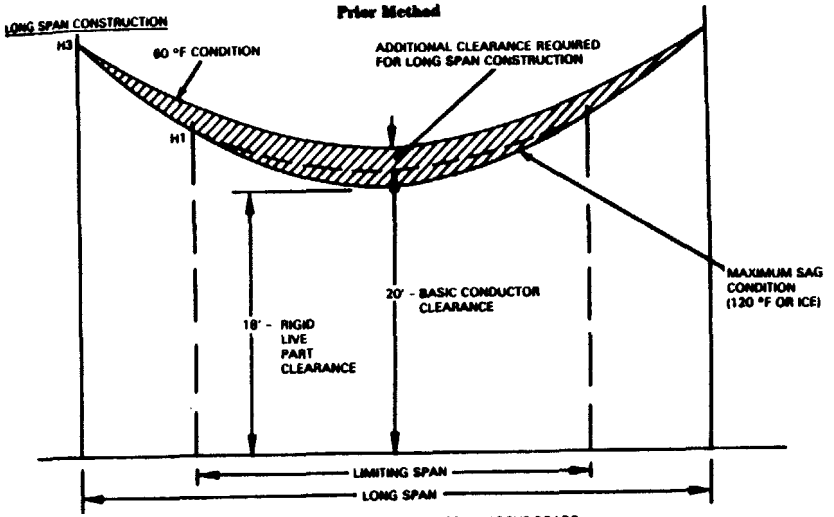
Prior Method



CONDITION — CLEARANCE OF OPEN SUPPLY CONDUCTORS, 750 V-22 kV, ABOVE ROADS
//////// — CONDUCTOR MOVEMENT
----- POSITION OF CONDUCTOR FOR BASIC CLEARANCE CONDITION (FIG 1)
REQUIRED CLEARANCE (@ 60 °F) = BASIC CLEARANCE (20') + ADDITIONAL CLEARANCE REQUIRED FOR HIGH TEMPERATURE OPERATION (ABOVE 120 °F)

Fig 2
Additional Clearance Required for High Temperature Operation

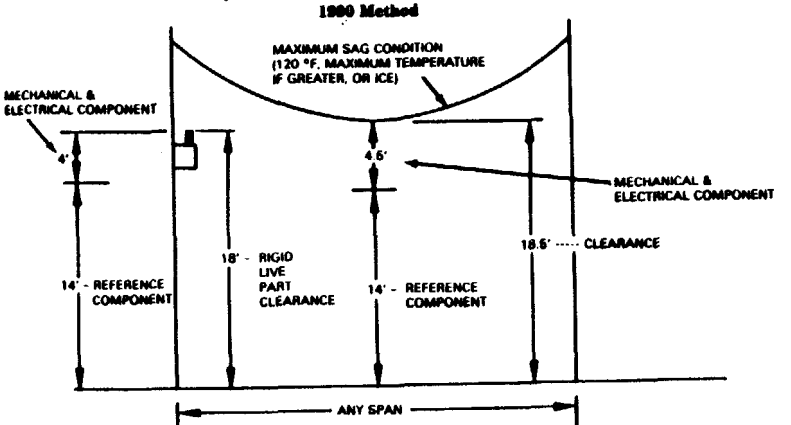
Prior Method



CONDITION — CLEARANCE OF OPEN SUPPLY CONDUCTORS, 750 V-22 kV, ABOVE ROADS
//////// — CONDUCTOR MOVEMENT
----- POSITION OF CONDUCTOR FOR BASIC CLEARANCE CONDITION (FIG 1)
REQUIRED CLEARANCE (@ 60 °F) = BASIC CLEARANCE (20') + ADDITIONAL CLEARANCE REQUIRED FOR LONG SPAN CONSTRUCTION (ASSUMING MAXIMUM CONDUCTOR TEMPERATURE LIMITED TO 120 °F)

Fig 3
Additional Clearance Required for Long Span Construction

1980 Method



CONDITION — CLEARANCE OF OPEN SUPPLY CONDUCTORS, 750 V-22 kV, ABOVE ROADS
CLEARANCE (18.5') = REFERENCE COMPONENT (14') + MECHANICAL AND ELECTRICAL COMPONENT (4.5')

Fig 4
Clearance at Maximum Sag

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
TCA MANAGEMENT CO.; TELESERVICE CORPORATION OF AMERICA; and TCA CABLE OF AMARILLO, INC.	)	
	)	
Complaintants,	)	
	)	
v.	)	File No. 90-002
	)	
SOUTHWESTERN PUBLIC SERVICE COMPANY,	)	
	)	
Respondent.	)	

TO: The Common Carrier Bureau

DECLARATION OF TROY GRIDER

I, Troy Grider, so state:

1. I am district technician for TCA in Amarillo, with responsibility for outside plant for the systems at issue in this case. I have served with the system since 1974 (under prior ownership).

2. SPS does set midspan poles in long span (greater than 250') configurations for CATV attachments. However, the practice first began 18 months - 2 years ago, after SPS revised its internal ice loading calculations. We paid an average of $750 for each such pole. None of these poles are old enough to require replacement, and to my knowledge none have been replaced.

3. The specifications for the attachment hardware we use are: 1½" clamp, affixed with 5/8" bolt.

4. SPS-owned poles are much taller than the typical communications-only poles. The attached photographs, taken December 11, 1990 in Amarillo, illustrate the comparative heights.

5. The average span for SPS facilities is approximately 200'.

Signed under penalty of perjury.

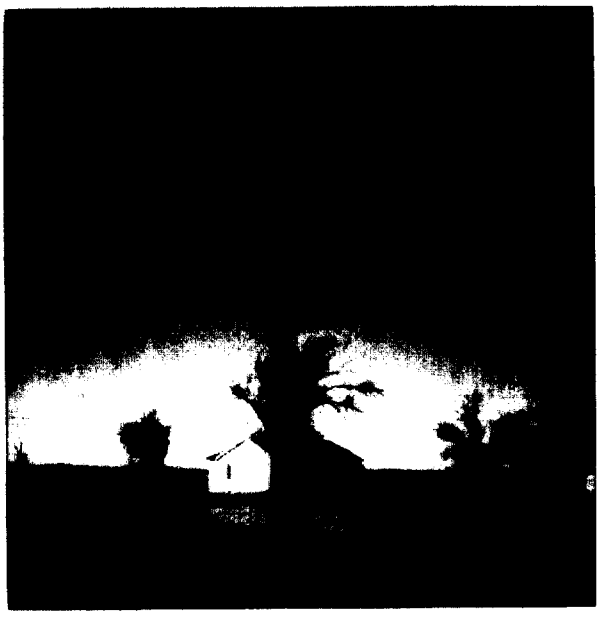
Troy Gruder

TROY GRIDER

Behind TCA

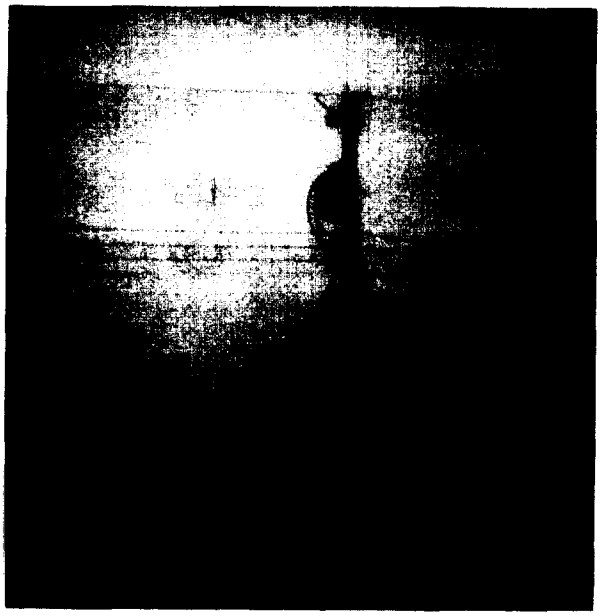
PHOTOGRAPHS OF POLES
TAKEN DEC. 11, 1990
AMARAILLO, TEXAS

Note racking of power lines of various voltages (all lines other than lowest wire on pole). Typical pole is 40' for this configuration.



Mills ln.

Communications only pole, with telephone (bottom) and cable (12" above). Typical pole is 30-35' for this configuration.



Only Power Attachments on these Poles. Note attachment height and size of pole unchanged even though no communications lines are on the pole.

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
TCA MANAGEMENT CO.; TELESERVICE CORPORATION OF AMERICA; and TCA CABLE OF AMARILLO, INC.	)	
	)	
Complaintants,	)	
	)	
v.	)	File No. 90-002
	)	
SOUTHWESTERN PUBLIC SERVICE COMPANY,	)	
	)	
Respondent.	)	

TO: The Common Carrier Bureau

AFFIDAVIT OF MARTHA S. HENSLEY

My name is Martha S. Hensley. I am Vice President of Administration for TCA Management Co. On July 20, 1989, TCA attempted to negotiate a reduction in rates from SPS. Nathan Geick, our Executive Vice President of Operations for Texas; Brady DeBord, our Amarillo General Manager; Paul Glist, our communications counsel; and I all met with Gerard Diller, Jerry Whitaker, Ken Lloyd and Kathleen Allen of SPS at SPS offices in Amarillo. During the course of that meeting, we explained why the SPS pole rate violated FCC standards. SPS advised us that they recognized that the FCC rate would be about $2.00, but that they disagreed with the FCC formula. SPS refused to reduce the rate, and required us to pay the higher rate. Because SPS controls the poles in Amarillo, we have no alternative but to

stay on SPS poles and seek recourse at the FCC. The contract is hardly the result of "arms length bargaining."

On oath I do state that I have read the foregoing Reply attached hereto; that I am familiar with the matters contained therein and know the purpose thereof; and that the facts set forth therein are true and correct to the best of my knowledge, information and belief.

Martha S. Hensley
MARTHA S. HENSLEY

Subscribed and sworn to before me
this 19th day of December 1990.

Karen L. Schlattner
Notary Public KAREN L. SCHLATTNER

My Commission Expires: 3/21/93

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing "Reply" were properly mailed, postage prepaid, this 21st day of December, 1990, to the following:

Paul Kelly, Jr.
S. Barry Paisner
Hinkle, Cox, Eaton, Coffield & Hensley
Post Office Box 2068
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825 North Capitol Street, N.E.
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Julie P. Gordy

* By Hand Delivery